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RECONSTRUCTION OF THE FUEL BALANCE

- USSR -

by D. Notkin

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FOREWORD

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- USSR -

Following is a translation of the article by D. Notkin in the Russian language periodical Planovoye Khozyaystvo (Planned Economy), Moscow, Vol. XXXVI, No. 1, 1959, pp. 43-52.

In the theses of the report of Comrade N. S. Khrushchev "Control Figures of the Development of the National Economy for the 1959-1965 Period", much attention is devoted to the development of a fuel and power basis for the national economy of the USSR.

Fuel is the most important element in the production-cost make-up of pig iron, non-ferrous metals, coke, cement, and power developed by thermal electric power stations. It constitutes a considerable part of the expenses of railroad, water, motor-vehicle, and aircraft transport, and also influences the level of agricultural production costs. The quantity, quality, and cost of the fuel and power employed in every branch of the economy predetermine to a considerable extent the possible development level of the output, and the economic indicators thereof.

Of the total production costs, expenditures on fuel constitute: at electric power plants -- 54-63%, in the cement industry -- about 30%, in ferrous metallurgy -- 23-24%, in the lumber and paper industry -- 15-17%, in the building-materials industry -- 16-18%. Reducing the cost of fuel can have a very significant effect on reduction of the cost and prices of industrial and agricultural products and transport services, and can in no small degree facilitate the further growth of social labor productivity.

In our country, which possesses the richest natural resources of various kinds of mineral fuel, the output of coal has to date increased 17 times in comparison with 1913, that of peat 33 times, and of petroleum 11 times. The output of shale has also undergone great development. In recent years, a powerful gas industry has rapidly developed. The output of all kinds of mineral fuel in 1958 reached (in conventional terms) about 590,000,000 tons. This exceeds the 1913 level by over 15 times, and the 1940 level by almost 3 times.

During the years of Soviet power, the inefficient concentration of the fuel-extraction industry in the southern part of European Russia, far from the principal fuel-consuming regions, has been overcome. In 1913, 87% of all the coal was mined in the Donets Basin, and over 97% of all the petroleum was extracted in the Caucasus region. Although the country's old fuel centers are continually expanding their output, their relative share in the production of fuel has decreased considerably.

The Donbass region now yields about 37% of the country's coal production, and the share of the Caucasian regions in the total production of petroleum comes to less than 23%. The process of shifting the center of gravity of the fuel industry from the southern part of European Russia to the Volga region, and particularly to the eastern part of the USSR, where the principal explored reserves of cheap fuel are concentrated, has considerably accelerated in recent years and exercises a decisive influence on the formation of the country's prospective fuel balance.

In effecting the extensive industrialization of all the regions of the country and particularly of the formerly economically backward hinterlands, the Party and the government had posed the problem, already in the first period of existence of the Soviet government, of establishment in all the economic regions of fuel and power bases, without which it was impossible to give serious consideration to the country's industrial and cultural development.

The plan for the electrification of the country, in which, as is well known, is incorporated the construction of a large network of regional electric power plants based on local fuels, is indissolubly bound to the extensive production of cheap types of fuel. Development of the production of cheap, local types of fuel has exercised, and continues to exercise a great positive effect on an increase in the scale, and improvement in the distribution of the fuel industry, with the attendant reduction of inefficient expenditures of social labor. Along with this, of enormous significance in the fundamental improvement of the geographical aspect of the fuel industry of the USSR, was the discovery of immensely rich deposits of coal and petroleum, and the establishment, on the basis thereof, of new coal and petroleum centers of all-Union significance: for coal -- the Kuznetsk, Karaganda, Pechorsk, and other bases, for petroleum -- the Bashkierskiy, Tatarskiy, Kuybyshevskiy, and a number of other petroleum regions.

The advances of the fuel industry could have been even more considerable, if, in the past, errors had not been permitted to occur, the essence of which lies in the fact that over the course of a number of years the fuel balance of the country was being constructed without consideration of the problems of the advantageous development of the production, and extensive utilization in the national economy, of the most economical kinds of fuel. In spite of the fact that the opportunities for more rapid development of the petroleum and gas industry, and that the economic advantages of petroleum, and particularly of natural gas, were constantly becoming more apparent, the share of these fuels in the total volume of mineral-fuel production was until 1956 changing at an insufficient rate. This is attested to by the following data (in%, recalculated in terms of "standard" fuel:

Years	Coal	Petroleum	Natural Gas	Peat	Combustible shales
1940	69.6	21.8	2.0	6.3	0.3
1950	72.6	19.5	2.4	5.1	0.4
1955	68.5	23.7	2.6	4.6	0.6

As has been already noted earlier in the press, the incorrect trend in the formation of the country's fuel balance was also being supported by some of the representatives of economic science, who did not at the proper time perceive the progressive tendencies in fuel production.

The restriction of the rates of development of the petroleum, and particularly of the gas industry was reflected not only in plans for the future, but also in practical work for satisfying the country's fuel requirements. The employment of mazut and gas as fuels for industrial establishments, electric power plants, and transport was considered to be improper, was in all manner of ways restricted, or was prohibited. On the insistence of the former Gosplan USSR/USSR State Supply Administration, railroads, river vessels and seaships, electric power plants and industrial establishments were being hurriedly converted from liquid and gas fuel to solid fuel.

Serious miscalculations occurred also in the development of local fuel bases. Due to lack of departmental integration, the production of uneconomical fuel types would sometimes increase while the cheap fuel reserves, available in the same region, were being worked too slowly. Thus, in spite of great opportunities for the development of petroleum production and for the production of cheap mazut in Bashkiriya, considerable funds were being allocated to increase the output of lignites, situated close to the oil fields. The quality of these lignites is poor - the efficiency is 2240 cal/kg, the ash content is 18-40%, the moisture is within the limits of 42-55%. The cost of a ton of Bashkir coal is (in terms of "standard" fuel) 8 times, and the relative capital outlay per ton of output increment is 1.6 times higher than are the corresponding indicators for a ton of local mazut. Expressed in kind, one ton of mazut replaces about 4.5 tons of Bashkir coal.

For a long time, in the Saratovskaya oblast', shales were being produced which were delivered to the local electric power plants. In terms of "standard" fuel, the cost of a ton of shale is about 18 times that of natural gas. This shale continued to be produced even many years after the discovery of large deposits of cheap Saratov natural gas. There was a period (1949-1954), when in connection with prohibition of the use of natural gas for industrial purposes, its production was artificially restricted, and the production of low-calorific and expensive shales grew.

The Kashpir shales are produced to this day in the Kuybyshev oblast', which is rich in petroleum and natural gas. In terms of "standard" fuel the cost of these shales is almost 10 times that of local mazut. An example of the exploitation of a local fuel deposit without sufficient regard for economic factors is also to be found in the excessive development of coal production in the Moscow region, such coal being the most expensive in the European part of Russia.

The period following the Twentieth Party Congress was marked by substantial advances in the production of gas and oil. In the period from 1956 to 1958, petroleum production increased 1.6 times, and the

production of natural and side-product gas increased by 27%. The share of petroleum and natural gas in the total output of mineral fuel rose from 26% in 1955 to 33% in 1958.

The economic advantages of petroleum and natural gas over other kinds of fuel are indisputable. In 1955, the average cost of a ton of petroleum in terms of "standard" fuel was 2.7 times lower than that of coal, and gas was 7.3 times cheaper than coal. These indicators are continuing to improve. In 1957, the cost of petroleum had already become almost 4 times less, and the cost of natural gas 13 times less than that of coal.

In marking out the program for the subsequent development of the fuel industry, our Party takes as its starting point those proportions in the development of its branches which, making use in every way of the natural wealth of the country, would permit optimum results to be attained in the development of natural resources with a minimum outlay of labor and materials. This provides a time gain in the peaceful economic competition with capitalism.

"If," -- Comrade N. S. Khrushchev has said, "we were to satisfy the requirements of power engineering, industry, and transportation by means of expensive coal, and the leading capitalist states were to develop their power engineering and industry on the basis of gas and petroleum, it would be difficult for us to catch up with them."

"Therefore, in working out the prospective plan for the development of the national economy, we incorporate into it the extensive utilization of natural gas for electric power plants, industry, and transportation, at the same time satisfying the community and household requirements of the population, as well as the needs of the chemical industry for gas as a raw material in the production of synthetics."

In the new prospective plan, the interrelationship between the development of the coal, petroleum, and gas industries is established with account taken of the condition and location both of the surveyed and the potential fuel reserves, the level of the relative capital investment per unit of resulting production capacity, the labor-productivity level and the production-cost level, and finally, the working conditions in each of the branches of the fuel industry and in each economic region of the country.

A decisive improvement is to take place in the forthcoming Seven-Year Plan period, in that the development of the petroleum and gas industry will put them in the lead, and the scope of application of natural gas and petroleum will be expanded in the European portion of the USSR, in the Urals region, and in Central Asia. Along with this is scheduled an accelerated development of the production, in Siberia and Kazakhstan, of the cheap varieties of coal which constitutes the mainstay of the power-engineering facilities of those regions. The fuel balance takes into account the fact that the petroleum and gas industry is becoming a supplier of fuel not only for engines and for the community and household needs, but also for industrial enterprises and electric power plants, for railroads, and for water transport. In addition, petroleum and gas

constitute highly important sources of cheap raw material for the chemical industry.

The country's fuel-production structure is undergoing radical changes as a result of a sharp increase in the production and use of the most up-to-date kinds of fuel. The most rapid development rates contemplated for the 1959-1965 period are for the production of natural gas (5.6 times), side-product gas (2.8 times), and petroleum (more than double), while coal output is scheduled to increase 20-23%, the output of peat 36%, and that of shales 61%. Over seven years, the output increment of petroleum will be equivalent to 168-182 million tons of "standard" fuel, that of gas to 143 million, and that of coal to 75-81 million tons. Consequently, the combined output increment of petroleum and gas will, in terms of "standard" fuel, be about four times that of coal.

In this connection the share of petroleum and gas in the total output of mineral fuel will rise to 51% in 1965 as compared to 31% for 1958. The extensive use of gas and mazut fuel for the technical requirements of industry will promote an increase in the productivity and an improvement in the work-quality indicators of thermal electric power plants, metallurgical facilities, machine-building establishments, the cement industry, and other branches of the national economy.

In order to avoid subsequent errors in the development of local fuel bases, it is essential that determination of the specific type of fuel suitable for some region be based on a penetrating comparative analysis of the technical and economic indicators for all types of fuel, both local and non-local. This will make it possible to select, in each individual case, the fuel types that are most advantageous from the standpoint both of required capital and of cost.

Significant in this respect are calculations characterizing the economics of the supply of various types of fuel in 1965 to such an extremely important section of the country as the Urals region. Taking as a unit the relative capital investment for the capacity increment necessary to produce the equivalent of one ton of "standard" fuel in terms of Bakhara gas, and to transport it into the vicinity of Sverdlovsk, the corresponding indicators will be: for Bashkir mazut -- 1.01; for coals: Ekibastuz -- 1.15, Kuznetsk -- 1.21, Kushmurunsk -- 1.7, Bashkir -- 2.44, and for peat (local fuel) -- 1.46. Costs of the production and transport of a ton of "standard" fuel delivered at Sverdlovsk are, in rounded figures (Bashkir coal - 1): for Bukhara gas -- 1.78, for coals: Kuznetsk - 2.87, Ekibastuz - 2.74, Kushmurun -- 3.26, Bashkir -- 5.38, and for peat -- 2.61.

From a comparison of these data it is not difficult to draw the conclusion that most advantageous of all is the use, in the Urals region, of Bashkir mazut and Bukhara gas. Furthermore, the expediency of delivering gas to the Urals region is determined not only by its low cost compared to that of coal, but to even a greater extent by the efficiency of its application in metallurgy, at establishments of the building materials industry, in machine-building plants, and in a number of other branches of industry.

Still greater economic advantages will be obtained from the employment of natural gas in regions of the European part of the USSR which possess large deposits of it, or which lie in the path of natural-gas pipelines, and also from the employment of mazut fuel in the regions where its production is concentrated (Transcaucasia, the Northern Caucasus region, the Volga region, and some other regions of the country).

With an increase of 80% in the country's total volume of industrial output during the forthcoming seven-year period, the need of the national economy for fuel will increase by approximately 56%. For industry and transport as a whole, as a result of the introduction of new techniques and the more efficient utilization of fuel, the norms of fuel consumption for 1965 are expected to be more than 18% lower than those for 1958; in terms of "conventional" fuel this constitutes a saving of 115,000,000 tons of fuel. The principal measure undertaken with respect to fuel savings is the replacement of steam-locomotive traction in railroad transportation by the more efficient electric-and diesel-locomotive forms of traction, and the conversion of steam locomotives from coal to mazut operation. In 1965, diesel and electric locomotives are to haul over 87% of the total railroad-transportation tonnage, as compared with 26% in 1958.

The conversion of railroad transport to electrical and diesel traction permits a reduction of 2.8 times in the fuel consumption per unit of work (taking into account the fuel consumed in the production of electric power for electric locomotives), and the total of fuel savings by locomotives will in 1965 reach about 67 million tons of "standard" fuel.

The conversion of steam locomotives from coal to mazut operation will start in 1959. An annual increase in mazut consumption of 4.5-7 million tons will in the seven forthcoming years release over 81 million tons of coal for other uses. The share of coal in the fuel consumed by railroad transport is to drop from 86.6% in 1958 to 11.4% in 1965, while the combined share of mazut and diesel fuel is to rise from the present to 51% in 1965.

Over 27 million tons of fuel is to be saved at thermal electric power plants, both through the introduction of high-pressure and super high-pressure steam and an increase in unit size, and through an increase in the proportion of the more up-to-date regional electric power plants in the electric-power supply system. The structure of fuel consumption at the electric-power plants will change substantially. To be true, the principal type of fuel, particularly in the eastern part of the USSR, will remain coal. However, the proportion of petroleum and gas fuel will increase from 16.6% in 1958 to 29.5% in 1965. As a result of the employment of cheap types of fuel, the cost of electric power at thermal electric power plants will be approaching that of hydroelectric power.

A substantial reduction of the fuel-consumption norms is to take place in the metallurgical industry. Expansion of the use of oxygen in open-hearth production, and improvement of furnace technology and design,

make it possible to reduce the fuel-consumption norm for steel melting by 8.2%, and in the manufacture of rolled products by 3.9%.

Big changes in the fuel-consumption structure are to take place in the cement industry, where the proportion of petroleum and gas fuel will increase from 16.7% in 1958 to 71.7% in 1965.

It is planned that the relative consumption of fuel for the community and household needs of the population, calculated in terms of one inhabitant, will be increased 50%. In 1965, 14,000,000,000 cu m of gas are to be used for these purposes, 2.6 times the 1958 quantity of coal is to be put on the market, and its quality is to be raised through augmented delivery of high-grade coal and coal briquettes.

The fuel balance also provides for the increased use of such secondary fuel resources as blast-furnace and coke gas, coke waste, intermediate products and tailings, wood waste, etc.

In bringing about the surpassing development of the petroleum and gas industries, we must not forget the enormous value to us of the coal industry. In absolute terms, not only will the output of coal not decrease, but it will on the contrary increase, although at lower rates than heretofore. It is of primary importance to ensure an increase in the output of coking coals, which constitute the fuel basis of the metallurgical industry, and also to make use of the enormous coal reserves of Siberia and Kazakhstan to provide for the rapidly growing industry of the eastern part of the USSR.

A feature of the coal deposits of the eastern regions, which is of extreme importance to the national economy, is the possibility of their being worked with incomparably lower capital investment and operational costs than those in the European part of the country. Thus, the capital investment required for the production of one ton of coal in the basin of western Siberia is 2.5 times, and in the Kuznetsk Basin is 1.5 times less than in the Donets Basin. The production costs of Kamsk-Achinsk and Irkutsk - Chermukhovo coals are 3-5 times lower than in the other principal coal basins of the USSR. Many coal deposits in Siberia can be worked by the open-pit method. In such cases, the labor productivity of the miners is approximately 5-6 times higher than in the shaft method of coal production.

The mechanical beneficiation of coal will be increased to 42% in 1965, as compared with 27% in 1958, and, taking into account sorting and bricquetting at the mine, the relative share of processed coal will rise to approximately 60%.

The widespread application of mechanisms has led to a considerable increase in the production of coal fines. These fines and culm must, to the maximum possible extent, be burnt up at electric power plants located in the areas where they are produced. It is expedient to subject the fine classes of bituminous coal to caking, in order to prevent the pollution of city air by soot products. Favorable conditions are now being created for concentration of the efforts of workers of the coal industry in solving these most important problems.

The principal condition for raising qualitative indicators in the coal industry is development of the least labor-intensive methods of coal production, primarily the open-pit and the hydraulic methods, completion of the integrated mechanization of shaft mining and conversion to the automation thereof, the surpassing development of coal production in those regions where the least labor input is required for production of high-grade coal.

Total coal output is to be increased in 1965 to 596-609 million tons. Therein the share of coal for power purposes is to be reduced from 81.1% in 1958 to 75.2% in 1965, and the share of coal for coking purposes is to rise from 18.9% to 24.8%; for this purpose it will be necessary, over a brief period of time, to carry out a considerable program of new shaft and pit construction.

The facts presented here indicate that the present methods of compiling the fuel balance require considerable improvement.

An examination of the structure of the fuel balance for power fuel (coal for coking purposes being deducted) shows that the shifts in fuel consumption will be approximately as follows:

	1955	1958	1960	1965
Coal	72.9	69.4	63.9	49.2
Petroleum fuel	10.9	12.1	13.1	17.8
Gas	2.6	7.5	13.1	24.8
Peat	5.1	4.7	4.1	3.6
Shales	0.8	1.0	1.1	1.1
Wood	7.7	5.3	4.7	3.5

From these data it can be seen that the consumption of gas as a power fuel will in 1960 catch up with that of petroleum fuel, and in 1965 will considerably exceed it and will occupy second place after coal. The share of petroleum and gas in the fuel balance will in 1965 attain 42.6%, and will be more than double the 1958 figure.

For purposes of the optimum distribution of fuel production, calculations have been made of the demand for fuel broken down on the basis of the following consolidated regions: European portion of the USSR, the Urals region, and the eastern portion of the USSR (without the Urals). Here the following shifts will take place:

	Share in %		Increase of 1965 demand, in % of 1958
	1958	1965	
European USSR	64.5	59.1	134.0
Urals	16.7	16.9	157.0
Eastern USSR (without Urals)	18.8	24.0	198.0

Although fuel-consumption growth rates in the European portion of the USSR are expected to be the lowest, the absolute increase in this consumption will here be at its greatest. The eastern regions will occupy second place, and the Urals will be third.

Total coal consumption in the European portion of the country will increase but by 7%, whereas the consumption of petroleum fuel will double, and that of gas will increase 3.8 times. The requirements of the regions lying between the Volga River and the Ural Mountains will be met principally by petroleum fuel. The shipment of power fuel from remote points to Transcaucasia will cease completely; this will be made possible due to the development of natural-gas production and an expansion of the mazut facilities in the Azerbaydzhanskaya SSR. The shipment of coal to the Volga region and to the Northwest will be restricted.

Exceptionally important shifts in the fuel-consumption structure will take place in the Urals region. The consumption of petroleum fuel will increase here 3 times, and natural-gas consumption will constitute about 27% of the total consumption of fuel. In this connection the use of power coal will be considerably restricted, including that of coal shipped in from the eastern regions.

In Siberia, Kazakhstan, and the Far Eastern regions, the full requirements will be met primarily through the medium of cheap coal, the consumption of which is to increase 1.85 times.

The Uzbek/skaya/, Turkomen/skaya/, Tadzhik/skaya/ and Kirgiz/skaya/ Union Republics will be provided with gas, petroleum fuel, and local coal.

Coal from remote Karaganda will continue to be shipped only to the northern part of Kirgiziya.

It is necessary to mobilize in all possible ways the enormous potentialities for efficient fuel utilization. Undeviating work should be carried on in raising the efficiency of thermal power units, reduction of the fuel-consumption norms, the reduction of heat losses and the utilization of waste heat, expanding the production of waste-heat boilers /kotlov utilizatorov/ and the installation thereof behind furnaces wherein much heat is lost with the exhaust gases, the erection of recuperators for the heating of air and gas by waste heat-treatment-furnace combustion products, etc.

Such are the principal outlines of the country's new heat balance, which is a part of the grand plan for the development of the national economy of the USSR for the 1959-1965 period.

In order to provide a concept of the full grandeur of the forthcoming growth of the petroleum and gas industries, we shall present some data on the increase in the production of gas and oil over the past seven years and in the forthcoming two seven-year periods (the 1966-1972 period is represented on the basis of the assigned objective of attaining at the end of this period a petroleum output of 400 million tons and a gas output of 270-320 billion (270-320,000,000,000) cu m.

	1952-1958	1959-1965	1966-1972
Output increment for the entire period:			
Petroleum (million t)	71	117-127	160-170
Gas (billion cu m)	25	120	120-170
Mean annual increment:			
Petroleum (million t)	10.1	16.7-18.1	22.8-24.2
Gas (billion cu m)	3.6	17.1	17.1-24.3

The figures show that the highest rates of development of the petroleum and, especially, of the gas industry are to occur in the 1959-1965 period, and that completion of the tasks assigned for this seven-year period is a precondition for the complete actuality of the 15-year plan for petroleum and gas. The actual possibilities for fulfilling the indicated program are unquestionable, since potentialities have at present been made available in the petroleum industry which provide for the sure growth, over an extended period of time, of industrial petroleum reserves and production, in volumes which considerably exceed the current requirements of the country for white petroleum products and chemical raw materials. Prospecting operations are to increase markedly in the gas industry; the experience of recent years shows the effectiveness of such operations to be very high.

Prospects for the further increase of oil and gas reserves in the USSR are exceptionally favorable. The area occupied by sedimentary rock in which petroleum and gas resources are formed is 2.4 times larger in our country than in the USA. The presumed reserves of petroleum and gas in the USSR should exceed those of the USA by approximately the same factor.

Also of importance is the fact that the petroleum deposits being discovered /otkryvayemye/ in the USSR have a characteristic feature which makes for their considerably more efficient development than in the USA. Thus, in the USSR the average geological reserves per petroleum deposit discovered constitute over 100 million tons, and in the USA, not over 5 million tons, i. e., 20 times less.

Due to the ownership of land and mineral resources in the USSR by the people as a whole, to the methodical exploitation of the petroleum resources there, and also due to geological conditions more favorable to production (a predominance of deposits capable of holding water pressure) /(preobladaniye vodonapornykh rezhimov)/, as a result of which there becomes possible a widespread introduction of highly efficient methods of working the deposits, the final coefficient of extraction comprises 60-70% as compared with 33% in the USA. This also considerably increases our opportunities in the production of petroleum.

In the USA the production of oil by means of water pumped into the stratum is not highly developed, since frequently one deposit there is exploited by several private firms in competition with one another. Therefore, as has been indicated above, they extract not more than one third of the petroleum from the stratum. Thus, out of the 40 billion tons of geological oil reserves discovered in the USA, about 8 billion has already been extracted. About 5 billion tons more is due to be extracted. In this manner, over two thirds of the geological reserves will be irretrievably lost.

It should also be kept in mind that, due to the absence in our country of the enormous waste of social labor that is so typical for the petroleum and other branches of industry in the capitalist countries, the effectiveness of drilling in the USSR is considerably higher than it is in the USA. Thus for every 100 m drilled, 930 t of oil was produced in 1949, and 1,590 t in 1957, while in the USA, respectively 590 and 460 t were produced. This is also a favorable factor which permits development of the USSR petroleum industry at considerably more rapid rates than these at which development has taken place in the USA.

The employment of scientifically based systems for working petroleum deposits, whereby more complete extraction of petroleum from the ground is made possible, is taking place very slowly in the USA. The principal reason retarding the introduction of these methods is the division of petroleum deposits into numerous sections belonging to different private owners, which leads to the boring of an enormous number of extra wells.

Consequently, with respect to the introduction of progressive systems for working petroleum deposits, the USSR has great advantages over the USA, which without doubt reflects on the growth rates of petroleum and gas production. Sufficient to say, the increase in the annual level of petroleum production from 113 to 240 million tons, planned in the USSR for the forthcoming seven-year period, has required about 20 years in the USA. Analogous relationships could also be drawn with respect to the production of natural gas.

The tasks contemplated with respect to the increase of petroleum and gas production in our country are strenuous, but fully attainable. For their performance, it is necessary to mobilize the efforts of workers in the petroleum and intermediate-products branches of industry (neftyanoy i smezhnykh otrasley promyshlennosti).

In order to effect, in short order, a transition to employment in the national economy of rapidly increasing quantities of petroleum, petroleum products, and gas, much work must also be done in preparing for this in the industrial establishments and the transportation facilities. Of greatest significance with respect to gas are the measures, planned by the Party and the government, for providing the gas industry and gas users with pipes and highly productive compressors. Realization of these measures will provide for the full employment of gas. The production and consumption structure for petroleum products will in the USSR differ considerably from that which has evolved in the USA, where the principal portion thereof is used up by the disproportionately swollen

inventory of passenger cars. An incomparably greater role will be played in the USSR by diesel fuel and kerosene; and a smaller one by automotive gasoline, due to the smaller dimensions of our inventory of automobiles.

The most advisable trend in the development of the petroleum-processing industry of the USSR in the immediately forthcoming seven-year period should be considered as being the carrying out, in the fuel-scarce regions of the European portion of the USSR, the Urals area, and Central Asia, of a relatively superficial/neglubokoy/ processing of petroleum with the yield of considerable quantities of mazut fuel. In regions that are distant from the principal petroleum and gas deposits, and which have unlimited resources of cheap coal (Siberia, Kazakhstan, etc), "deep" processing of petroleum should be carried out. Attention should be paid most of all to raising the octane characteristics of automotive gasoline, reduction of the sulfur content, improving the solidification point of diesel fuel, and improving the service properties of automobile and tractor oils, as well as to the provision of high-quality raw materials to the chemical industry.

It should also be kept in mind that, in recent years, a substantial position among the incremental petroleum reserves was being occupied by deposits of heavy, high-sulfur and tarry oils. "Deep" processing of such oils is less effective than it is for conventional oils. It is therefore advisable to employ such oils for obtaining large quantities of cheap mazut. The plan made out for the 1959-1965 period contemplates an increase in the output of mazut fuel from 30 million tons in 1958 to 67 million tons in 1965, i.e., of 37 million tons, which is equal to the production of about 70 million tons of coal.

An increase in the production of diesel fuel is also contemplated, with the purpose of the additional conversion of railroad-and water-transportation facilities from steam to diesel engines. Considering that the use of diesel fuel in a diesel locomotive replaces (account being taken of efficiency) 12-13 tons of coal used in a steam locomotive, the increase of 8 million tons contemplated for the consumption of diesel fuel in diesel locomotives and in diesel-propelled ships is equivalent to the additional production of about 100 million tons of coal.

The fuel balance for 1965 will contain 46 million more tons of petroleum than in 1958. If we were not to do this, an increase in the output of petroleum to 184-194 million tons could have been sufficient, rather than to the contemplated 230-240 million tons. However, in such a case it would have been necessary to produce at least 170 million more tons of coal, for which it would have been necessary considerably to increase capital investment in mine building, and the operating costs of providing the national economy with fuel. This would have retarded the overall rate of development of the national economy, and would have impaired our position in the economic competition with the capitalist world.

Therefore expansion of the sphere of application of liquid petroleum fuel in the national economy must be regarded as one of the most important economic tasks of our prospective plan. Equally necessary is

the extensive application of natural gas as an industrial fuel and for production of electric power.

In examining the overall shifts in the fuel balance for 1959-1965, and its characteristic features, we consider it necessary to pause, if but briefly, on a very important methodological question. With the present methods of compilation of the fuel balance of the country, its structure differs considerably from the structure of fuel production. This is principally explained by the fact that in the fuel balance there is conventionally included only that portion of the petroleum and of the petroleum products, which directly replace coal or other forms of solid fuel. The resources of petroleum fuel refer to heating and marine mazut, and to diesel fuel used in diesel locomotives, diesel ships, and electric power plants, that is, where its employment displaces or replaces solid fuel. This signifies that of the quantity of diesel fuel scheduled for production in 1965, only 26% will be included in the fuel balance. Other white petroleum products (gasolene, kerosene, etc.) are not included in the fuel balance at all. Therefore petroleum and gas, which will constitute 51% of the mineral fuel produced in 1965, will comprise but 36% of the fuel balance for that year, the solid fuels, including wood, taking up 64% (with account taken of coal for coking).

It is characteristic that even that part of the diesel fuel which is used in diesel locomotives is measured in the heat balance, jointly with coal and the other kinds of fuel, in terms of caloric equivalent, whereas this equivalent in no way reflects the relationship between the indicated kinds of fuel on the basis of the work performed as a result of their use.

If coal, wood, gas, or any other kind of fuel is used for household consumption, they are included in the fuel resources. If kerosene is used for this purpose, it is not included in the fuel balance. The gas produced in the processing of petroleum, as also the mazut, is partially used as industrial fuel and in the production of electric power; however it is not counted among the fuel resources.

Examination of the question of radical changes in the structure of the country's fuel balance shows that the line being followed with respect to the preferential development of the petroleum and gas industry is a brilliant example of the creative approach of our Party to a solution of the problems involved in building communism. The significance of the rapid rate of development of the petroleum and gas industry is not exhausted by the possibility of a sharp improvement, on this basis, in the economics of the production and use of fuel, and of satisfaction of the country's requirements for fuel and petroleum products.

The basically new approach of the Central Committee of the CPSU to questions of long-range planning, the distinctive feature of which is the active and creative intervention of the Party in determining the paths of development of the Soviet economy, provides for selection of the most effective means of economic development and encounters the ardent approval and support of the entire Soviet people. The toilers of our country, the workers in the fuel industry will apply all their efforts to bring into reality the plan for the building of communism which is to be drawn up by the XXI Congress of the CPSU.

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